

# VEHICLE MAINTENANCE AND DURABILITY

*CleanFleet is a demonstration of panel vans operating on five alternative motor fuels in commercial package delivery operations in the South Coast Air Basin of California. The five alternative fuels are propane gas, compressed natural gas (CNG), California Phase 2 reformulated gasoline (RFG), methanol (M-85 with 15 percent RFG), and electricity. Data were gathered on in-use emissions, operations, and fleet economics. This volume of the final report summarizes the maintenance required on these vans from the time they were introduced into the demonstration (April through early November 1992) until the end of the demonstration in September 1994.*

*The vans were used successfully in FedEx operations; but, to varying degrees, the alternative fuel vehicles required more maintenance than the unleaded gasoline control vehicles. The maintenance required was generally associated with the development state of the fuel-related systems. During the demonstration, no non-preventive maintenance was required on the highly developed fuel-related systems in any of the unleaded gasoline production vehicles used either as controls or as RFG test vehicles. The maintenance problems encountered with the less developed systems used in this demonstration may persist in the short term with vehicles featuring the same or similar systems. This means that fleet operators planning near-term acquisitions of vehicles incorporating such systems should consider the potential for similar problems when (1) selecting vendors and warranty provisions and (2) planning maintenance programs.*

## Introduction

This volume of the final report summarizes data on the maintenance and durability of 20 CleanFleet vans running on propane gas, 21 vans running on compressed natural gas (CNG), 20 vans running on M-85, two electric vans, 21 vans running on California Phase 2 reformulated gasoline (RFG), and 27 control vans running on regular unleaded gasoline. The period of time covered by this report is from the introduction of the vehicles into the demonstration (April through September 1992) through the end of the demonstration (September 1994). The demonstration was conducted at five FedEx facilities in the Los Angeles area. Each site had one type of alternative fuel van and the associated control vans (i.e., unmodified production versions of the CleanFleet vehicles built to operate on unleaded gasoline) from each manufacturer of the alternative fuel vans.

In general, the vans were used successfully in FedEx operations. To varying degrees, the alternative fuel vehicles required more maintenance than the unleaded gasoline control vehicles, and that maintenance was associated with the state of development of the fuel-related systems. In this regard, it is important to note that, during this demonstration, no non-preventive maintenance actions were required on the highly developed fuel-related systems in any of the gasoline production vehicles used either as controls or as RFG test vehicles. The maintenance problems encountered with the less developed systems used in the demonstration may persist in the short term with vehicles featuring the same or similar developmental systems. Therefore, fleet operators planning near-term acquisitions of vehicles incorporating such systems should consider the potential for similar developmental problems when they (1) select vendors and warranty provisions and (2) plan maintenance programs.

## **VEHICLE MAINTENANCE**

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None of the maintenance problems associated with the alternative fuel technologies evaluated in this report are likely to be insolvable in developing these technologies for incorporation into future production vehicles. Their coverage here should, however, help to indicate both the relative state of development of these technologies and the areas warranting attention.

This volume of the findings of the project is divided into five sections following the Introduction: Vehicle Information, Vehicle Maintenance, Oil Consumption and Analysis, Engine Teardown, and Discussion. The Discussion summarizes the results and places them in perspective.